CHAPTER 3
VEHICULAR TRAFFIC

3-1. Effect on Pavement Design.

Pavement thickness must be designed to withstand the anticipated traffic, categorized by type and weight of vehicles, and measured by average daily volume (ADV) of each type for the design life of the pavement. For most pavements, the magnitude of the axle load is of greater importance than the gross weight of pneumatic-tired vehicles because axle spacings are generally so large that there is little interaction between the wheel loads of one axle and the wheel loads of the other axles. Thus, for the case of pneumatic-tired vehicles having equal axle loads, the increased severity of loading imposed by conventional four- or five-axle trucks as compared with that imposed by two- or three-axle trucks is largely a fatigue effect resulting from an increased number of load repetitions per vehicle operation. For forklift trucks where the loading is concentrated largely on a single axle and for tracked vehicles where the loading is evenly divided between the two tracks, the severity of the vehicle loading is a function of the gross weight of the vehicle and the frequency of loading. Relations between load repetition and required rigid pavement thickness developed from accelerated traffic tests of full-scale pavements have shown that, for any given vehicle, increasing the gross weight by as little as 10 percent can be equivalent to increasing the volume of traffic by as much as 300 to 400 percent. On this basis, the magnitude of the vehicle loading must be considered as a more significant factor in the design of pavements than the number of load repetitions.

3-2. Traffic Evaluation.

Procedures for the evaluation of traffic and selection of design index are as follows.

a. Pneumatic-tired vehicles. To aid in evaluating vehicular traffic for the purpose of pavement design, pneumatic-tired vehicles have been divided into the following three groups —

Group 1. Passenger cars, panel trucks, and pickup trucks
Group 2. Two-axle trucks
Group 3. Three-, four-, and five-axle trucks

The design weights for various pneumatic-tired vehicles have been based on average weights, as determined from Federal Highway Administration traffic surveys made on public highways, plus one-fourth of the difference between these average weights and the maximum allowable weights. For group 2 and group 3 vehicles, maximum allowable weights are based on single-axle and tandem-axle loadings not exceeding 18,000 and 32,000 pounds, respectively. Since traffic rarely will be composed of vehicles from a single group, pneumatic-tired vehicular traffic has been classified into five general categories based on the distribution of vehicles from each of the three groups listed above. These traffic categories are defined as follows —

Category I. Traffic composed primarily of passenger cars, panel and pickup trucks (group 1 vehicles), but containing not more than 1 percent two-axle trucks (group 2 vehicles).

Category II. Traffic composed primarily of passenger cars, panel and pickup trucks (group 1 vehicles), but may contain as much as 10 percent two-axle trucks (group 2 vehicles). No trucks having three or more axles (group 3 vehicles) are permitted in this category.

Category III. Traffic containing as much as 15 percent trucks, but with not more than 1 percent of the total traffic composed of trucks having three or more axles (group 3 vehicles).

Category IV. Traffic containing as much as 25 percent trucks, but with not more than 10 percent of the total traffic composed of trucks having three or more axles group 3 vehicles).

Category IVA. Traffic containing more than 25 percent trucks.

b. Tracked vehicles and forklift trucks. Tracked vehicles having gross weights not exceeding 15,000 pounds and forklift trucks having gross weights not exceeding 6,000 pounds may be treated as two-axle trucks (group 2 vehicles) and substituted for trucks of this type in the traffic categories defined above on a one-for-one basis. Tracked vehicles having gross weights exceeding 15,000 pounds but not 40,000 pounds and forklift trucks having gross weights exceeding 6,000 pounds but not 10,000 pounds may be treated as group 3 vehicles and substituted for trucks having three or more axles in the appropriate traffic categories on a on-for-one basis. Traffic composed of tracked vehicles exceeding 40,000 pounds gross weight and forklift trucks exceeding 10,000 pounds gross weight has been divided into the following three categories —

Maximum Vehicle Gross Weight, Pounds

Category	Tracked Vehicles	Forklift Trucks
V	60,000	15,000
VI	90,000	25,000
VII	130,000	(*)

* Forklift trucks exceeding 25,000-pounds gross weight are treated in TM 5-809-12/AFM 88-3, Chap. 15.

c. Selection of design index. The design of pavements for Army and Air Force roads, streets, and similar areas is based on a "design index," which represents the combined effect of the loads defined by the traffic categories just described and the traffic volumes associated with each of the lettered classifications of roads or streets. This index extends from one through ten with an increase in numerical value indicative of an increase in pavement design requirements. Table 3-1 gives the appropriate design index for combinations of the eight traffic categories based on distribution of traffic, vehicle type, and the six-letter classifications based on the volume of traffic. For example, suppose an average daily traffic (ADT) of 2,000 vehicles composed primarily of passenger cars, panel trucks, and pickup trucks (group 1), but including 100 two-axle trucks (group 2) is anticipated for a road in flat terrain. First, the road class is determined from TM 5-822-2/AFM 88-7, Chap. 5 to be a class D road. Second, the group 2 vehicles are 100/2,000 or 5 percent of the total of groups 1 and 2, making this category II traffic. Therefore, the appropriate design index from table 3-1 is 2.

Table 3-1. Pavement Design Index

Traffic Category	Pavement Design Index for Road or Street Classification					
	A	B	C	D	E	F
I	2	2	2	1	1	1
II	3	2	2	2	2	1
III	4	4	4	3	3	2
IV	5	5	5	4	4	3
IVA	6	6	6	5	5	4
V (60-kilopound (kip) track-laying vehicles or 15 kip forklifts)	7	7	7	7	7	(*)
500/day	6	6	6	6	6	(*)
200/day	6	6	6	6	6	(*)
100/day	6	6	6	6	6	6
40/day	6	6	6	5	5	5
10/day	5	5	5	5	5	5
4/day	5	5	5	5	4	4
1/day	5	5	5	4	4	4
VI (90-kip track-laying vehicles or 25 kip forklifts)						
200/day	9	9	9	9	9	(*)
100/day	8	8	8	8	8	8
40/day	7	7	7	7	7	7
10/day	6	6	6	6	6	6
4/day	6	6	6	6	6	6
1/day	5	5	5	5	5	5
1/week	5	5	5	4	4	4
VII (120-kip track laying vehicles):						
100/day	10	10	10	10	10	10
40/day	9	9	9	9	9	9
10/day	8	8	8	8	8	8
4/day	7	7	7	7	7	7
1/day	6	6	6	6	6	6
1/week	5	5	5	5	5	5

* Traffic limited to 100 vehicles per day.

(1) *Tracked vehicles and forklift trucks.* Provision is made whereby the designer may determine pavement design requirements for tracked vehicles or forklifts in combination with traffic by pneumatic-tired vehicles or for traffic by tracked vehicles or forklifts only. Where pneumatic-tired vehicles, forklifts, and tracked vehicles are to be considered, the proper letter classification of the road or street is determined from TM 5-822-2/AFM 88-7, Chapter 5 according to the total volume of traffic from all types of vehicles. In table 3-1 the traffic for categories V, VI, and VII has been

divided further into various levels of frequency. If the tracked vehicle or forklift traffic is composed of vehicles from more than a single traffic category, it will be necessary for the designer to determine the anticipated frequency of traffic in each category in order to determine the appropriate design index. For example, 40 vehicles per day of category VI traffic require a greater pavement design index than does one vehicle per day of category VII traffic. Thus, the designer cannot rely on maximum gross weight alone to determine pavement design index values. For vehicular parking areas, the design index should be determined from the column for class E roads or streets, again taking into account the relative traffic frequencies where there are vehicles from more than a single traffic category.

(2) *Special-Purpose Vehicles.* Information regarding pavement design requirements for special purpose vehicles producing loadings significantly greater than those defined in this manual will be requested from Headquarters, US Army Corps of Engineers (CEMP-ET), or the appropriate Air Force Major Command.